PATENT ABSTRACTS OF JAPAN

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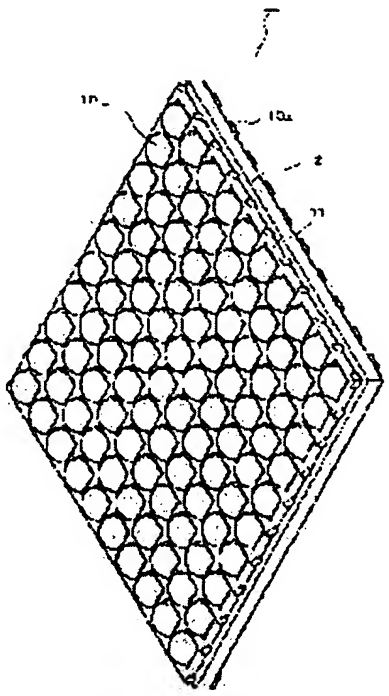
(54) METHOD FOR MANUFACTURING SOLAR BATTERY, AND SOLAR BATTERY

(57)Abstract:
PROBLEM TO BE SOLVED: To provide manufacturing method of a solar battery that can drastically improve productivity for reducing costs in an assembly process, and the solar battery.
SOLUTION: A plurality of spherical semiconductor cells 10 are placed in an aligned state while they enter the meshes of a mesh-shaped conductive member 11, each of the spherical semiconductor cells 10 and the mesh-shaped conductive member 11 are bonded by conductive paste 16, the mesh-shaped conductive member 11 becomes the outer electrode of a solar battery 1, a first conductivity- type semiconductor layer 14 that is exposed to the lower surface of the spherical semiconductor cell 10 is electrically joined to a conductive member 13 that is formed so that it penetrates an insulating member 12, an inner electrode 1 3a in the solar battery 1 that is formed so that the conductive member 13 projects from the lower surface of the insulating member 12 is formed for each of the spherical semiconductor cells 10, and further the light reception surface of the spherical semiconductor cells 10 is formed so that it is covered with a reflection prevention film 17.



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CLAIMS

[Claim(s)]
[Claim 1] The process which lays two or more spherical semi-conductor cels which have the semi-conductor layer of the 2nd conductivity type formed so that pn junction might be formed in the spherical substrate front face on which a front face constitutes the semi-conductor layer of the 1st conductivity type at least on a conductive mesh-like member, The process which makes the mesh of the conductive member of the shape of said mesh carry out ********** alignment of said spherical semi-conductor cel, The process which pastes up said spherical semi-conductor cel and the conductive member of the shape of said mesh with a conductive paste, The manufacture approach of the solar battery characterized by including the process joined on the process ground until said 1st semi-conductor layer exposes the underside of said spherical semi-conductor cel, and the insulating member which made the conductive member penetrate so that the 1st [said] semi-conductor layer which exposed the conductive member of the shape of said mesh may be touched.
[Claim 2] The manufacture approach of the solar battery characterized by including a wrap process for the light-receiving side of said spherical semi-conductor cel with an antireflection film in the manufacture approach of a solar battery according to claim 1.
[Claim 3] The solar battery characterized by joining the 1st semi-conductor layer which it was laid in the condition that two or more spherical semi-conductor cels aligned by ******** in the mesh of a conductive mesh-like member, and this spherical semi-conductor cel and the conductive member of the shape of said mesh pasted up with a conductive paste, and was exposed on the underside of said spherical semi-conductor cel on the conductive member formed so that an insulating member might be penetrated.
[Claim 4] The solar battery with which the light-receiving side of said spherical semi-conductor cel is characterized by being covered with an antireflection film in a solar battery according to claim 3.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field which carries out an invention group] This invention relates to the manufacture approach of a solar battery, and a solar battery, and relates to the manufacture approach of a solar battery and solar battery especially using a spherical semi-conductor.
[0002]
[Description of the Prior Art] The electron and electron hole which were generated when the internal field has arisen into the pn junction part of a semi-conductor, light is applied to this and the electron-hole pair was made to generate are separated by the internal field, an electron is brought together in the n side, an electron hole is brought together in the p side, and if a load is connected outside, a current will flow towards the n side from the p side. This effectiveness is used and utilization of a solar battery is advanced as a component which transforms light energy into electrical energy.
[0003] In recent years, the technique of forming a circuit pattern on a spherical semi-conductor (Ball Semiconductor) with a diameter [of a single crystal, polycrystalline silicon, etc.] of 1mm or less, and manufacturing a semiconductor device is developed.
[0004] The manufacture approach of the solar array which connected many semi-conductor particles, using aluminum foil as one is proposed (JP,6-13633,A). By this approach, as shown in drawing 4 , the semi-conductor particle 207 which has the 1st conductivity-type epidermis section and the interior of the 2nd conductivity type is arranged so that it may project from the both sides of aluminum foil 201 in opening of aluminum foil, the epidermis section 209 of one side is removed, and an insulating layer 221 is formed. Next, the part inside [211] the 2nd conductivity type and the insulating layer 221 on it are removed, and the 2nd aluminum foil 219 is combined with the removed field 217. The flat field 217 offers good ohmic contact to the 2nd aluminum foil 219 as a current carrying part.
[0005]
[Problem(s) to be Solved by the Invention] however, by the semi-conductor particle, i.e., the solar battery which covered with the cel of spherical diode with pn junction, which has the above 1st conductivity-type epidermis sections and the interior of the 2nd conductivity type In case the module substrate (the 2nd aluminum foil 219 of the above-mentioned conventional example) used as an electrode is equipped with the above-mentioned cel in an assembly process The amount of [the outcrop of the p type silicon layer which constitutes spherical diode, and / of n mold] silicon layer contacted the module substrate used as both electrodes, and there was a trouble of being easy to connect too hastily electrically.
[0006] Furthermore, in such a conventional assembly process, there was a trouble of it being highly said low that cost will become [productivity].
[0007] This invention can be accomplished in view of the above-mentioned trouble, can solve radically the problem of the electric short circuit in an assembly process, and productivity is high and it aims to let cost offer the manufacture approach of a solar battery and solar battery which can be reduced substantially.
[0008]
[Means for Solving the Problem] The process which lays two or more spherical semi-conductor cels which have the semi-conductor layer of the 2nd conductivity type formed as pn junction formed in the spherical substrate front face on which a front face constitutes the semi-conductor layer of the 1st conductivity type at least in the 1st of this invention on a conductive mesh-like member, The process which makes the mesh of the conductive member of the shape of said mesh carry out ********** alignment of said spherical semi-conductor cel, The process which pastes up said spherical semi-conductor cel and the conductive member of the shape of said mesh with a conductive paste, It is characterized by including the

process joined on the process ground until said 1st semi-conductor layer exposes the underside of said spherical semi-conductor cel, and the insulating member which made the conductive member penetrate so that the 1st [said] semi-conductor layer which exposed the conductive member of the shape of said mesh may be touched. According to this configuration, the mesh of a conductive mesh-like member is made to carry out ********** alignment of the spherical semi-conductor cel, and it is fixable while connecting this to the conductive member of the shape of a mesh which is a ground electrode electrically with a conductive paste. Moreover, the takeoff connection of an inside electrode can be extremely formed in high degree of accuracy by grinding this collectively. Furthermore, since the mesh part of a conductive mesh-like member and the part which made the conductive member (inside electrode) in an insulating member penetrate can form so that it may correspond beforehand Since the location of each spherical semi-conductor cel can manufacture the solar battery which aligned at high degree of accuracy by the comparatively simple approach, the problem of the electric short circuit in the assembly process of a solar battery can be solved radically, and productivity is high and cost can decrease substantially.

[0009] The 2nd of this invention is characterized by including a wrap process for the light-receiving side of said spherical semi-conductor cel with an antireflection film. According to this configuration, loss of the quantity of light by echo can be reduced, and an efficient solar battery can be manufactured.

[0010] It is laid in the condition that two or more spherical semi-conductor cels aligned by ******** in the mesh of a conductive mesh-like member, this spherical semi-conductor cel and the conductive member of the shape of said mesh paste up with a conductive paste, and the 3rd of this invention is characterized by joining the 1st semi-conductor layer exposed on the underside of said spherical semi-conductor cel on the conductive member formed so that an insulating member might be penetrated. According to this configuration, the solar battery with which the location precision of each spherical semi-conductor cel aligned at high degree of accuracy can be obtained, the problem of an electric short circuit is solved radically, and the solar battery which productivity is high and cost can reduce substantially can be offered.

[0011] The 4th of this invention is characterized by covering the light-receiving side of said spherical semi-conductor cel with an antireflection film. According to this configuration, loss of the quantity of light by echo can be reduced, and an efficient solar battery can be offered.

[0012]

[Embodiment of the Invention] Hereafter, the manufacture approach of the solar battery concerning this invention and the operation gestalt of a solar battery are explained to a detail with reference to a drawing. In the following operation gestalten, although explained by using the 2nd conductivity type as n mold, using the 1st conductivity type as p mold, n mold and the 2nd conductivity type can be similarly manufactured for the 1st conductivity type as a p mold.

[0013] The solar battery concerning 1 operation gestalt of this invention is laid in the condition that two or more spherical semi-conductor cels 10 aligned by ******** in the mesh of the conductive mesh-like member 11 so that a decomposition block diagram to explain the general drawing to drawing 1 , and explain the configuration to drawing 2 may be shown.

[0014] As a conductive member 11 of the shape of this mesh, it is desirable to use a conductive metal, and aluminum, stainless steel, molybdenum, etc. are used as a metaled class. About the approach of forming the conductive member 11 of the shape of this mesh, it can form by casting which slushes a metal into mold, the pressing method which pierces a mold from a metal plate, for example.

[0015] And each of this spherical semi-conductor cel 10 and the conductive mesh-like member 11 paste up with the conductive paste 16, and the conductive member 11 of the shape of this mesh serves as a ground electrode of a solar battery 1. As this conductive paste 16, solder, a silver paste, a copper paste, etc. can be used, for example.

[0016] in addition -- although the configuration of a mesh is shown as a rectangle in drawing 1 and drawing 2 -- other configurations -- ****** -- for example, circular, then the time of pasting up the spherical semi-conductor cel 10 with the conductive paste 16 -- the liquid of a paste -- who can do it few.

[0017] Moreover, p mold polycrystalline silicon (semi-conductor layer of the 1st conductivity type) 14 exposed on the underside of the spherical semi-conductor cel 10 is electrically joined to the conductive member 13 formed by screen-stencil, plating, etc. so that an insulating member 12 may be penetrated. For example, insulating tapes, such as a general printed circuit board or a TAB tape using a glass epoxy resin, BT resin, etc. as this insulating member 12, can be used.

[0018] And inside electrode 13a of the solar battery 1 formed so that this conductive member 13 might project on the underside of an insulating member 12 is formed every spherical semi-conductor cel 10.

[0019] The light-receiving side of the spherical semi-conductor cel 10 can also consider as the configuration covered with the antireflection film 17 (dotted-line part of drawing 1) still more preferably. Thereby, loss of the quantity of light by echo can be reduced, and it becomes an efficient solar battery.

[0020] Next, an example of the concrete manufacture approach is explained below. Each process of the manufacture approach is shown in drawing 3 and drawing 4 using some cross sections of the solar battery concerning 1 operation gestalt of this invention.
[0021] First, an example of the formation approach of the spherical semi-conductor cel 10 used for this operation gestalt is explained. It is made to fall, heating p mold polycrystalline silicon grain with a diameter of 1mm or p mold amorphous silicon grain in a vacuum, crystalline good p mold polycrystalline silicon ball (the 1st conductivity-type semi-conductor layer) 14 is formed, and n mold polycrystalline silicon layer (the 2nd conductivity-type semi-conductor layer) 15 is formed in this front face with the CVD method using mixed gas, such as a silane containing phosphoretted hydrogen. A CVD process performs thin film formation here by carrying out supply blowdown of the gas heated by desired reaction temperature, conveying a silicon ball within a thin tube.
[0022] In addition, this process can also form n mold polycrystalline silicon layer 15 by making desired gas contact on the way of [drop] while it spheroidizes making it fall heating p mold polycrystalline silicon grain or p mold amorphous silicon grain in a vacuum and forms p mold polycrystalline silicon ball 14. Moreover, n mold impurity diffused layer may be formed in the front face of p mold polycrystalline silicon grain or p mold amorphous silicon grain by doping which used a gaseous-phase thermal diffusion method and ion-implantation.
[0023] Next, the mesh of the conductive mesh-like member 11 is made to carry out ********** alignment of the spherical semi-conductor cel 10 formed as mentioned above. In order to use many spherical semi-conductor cels 10 at this time, as it lays so that many spherical semi-conductor cels 10 may be scattered on the conductive mesh-like member 11, and this scattered spherical semi-conductor cel 10 is swept with the brush etc., as a desirable example of an approach which makes a mesh carry out ********** alignment efficiently, the ********** approach is in the mesh of the conductive mesh-like member 11.
[0024] Moreover, there is the approach of using a cel adsorption fixture as shown in drawing 6 as other more desirable examples. Hereafter, this approach is described. Drawing 6 is the sectional view (a) of a cel adsorption fixture, and a bottom view (b). In drawing 6 , the cel adsorption fixture 18 is the dimension which agrees in the mesh of the conductive mesh-like member 11 in the base (refer to (b) of drawing 6), and two or more crevices 19 in which the spherical semi-conductor cel 10 is held are formed.
[0025] And attract the spherical semi-conductor cel 10 with an aspirator (not shown), and it is made to hold in this crevice 19, and the spherical semi-conductor cel 10 is inserted in in the mesh of the conductive mesh-like member 11 with the condition of having made it drawing in, and an aspirator is made to stop and lay. The condition of having made the mesh of the conductive member 11 of the shape of a mesh which shows the spherical semi-conductor cel 10 to (a) of drawing 3 carrying out ********** alignment using the above approach is (b) of drawing 3 .
[0026] Next, as shown in (c) of drawing 3 , the spherical semi-conductor cel 10 and the conductive member 11 of the shape of said mesh are pasted up with the conductive paste 16. Thereby, the conductive mesh-like member 11 serves as a ground electrode of a solar battery.
[0027] Next, by grinding, as shown in (d) of drawing 3 , n mold polycrystalline silicon layer 15 is removed from the spherical semi-conductor cel 10 until p mold polycrystalline silicon 14 of a field exposes a part. Here, the spherical semi-conductor cel 10 is inserted in the conductive mesh-like member 11, and it fixes in conductive paste 16 grade, and in order to hold the spherical semi-conductor cel 10 in one, to make grinding equipment contact and to perform grinding, it becomes possible to acquire a flat and uniform disclosure side. In the case of this grinding, the above-mentioned cel adsorption fixture 18 can be used, grinding can be carried out in the condition of having made the spherical semi-conductor cel 10 adsorbing, and grinding can be performed thereby more certainly.
[0028] Next, as shown in (e) of drawing 4 , it joins on the insulating member 12 which made the conductive member 13 penetrate so that p mold polycrystalline silicon 14 which exposed the conductive mesh-like member 11 may be touched. At this time, the above-mentioned cel adsorption fixture 18 is used, and you may make it join in the condition of having made the spherical semi-conductor cel 10 adsorbing, alignment of the spherical semi-conductor cel 10 and the conductive member 13 can be made easy by this, and it can join to an insulating member 12 more certainly.
[0029] In accordance with the pitch of the mesh of the conductive mesh-like member 11, the part which made the conductive member 13 in this insulating member 12 penetrate is formed so that it may correspond beforehand. And this conductive member 13 that corresponded every spherical semi-conductor cel 10 is formed so that it may project on the underside of an insulating member 12, and this projection part is set to inside electrode 13a of a solar battery.
[0030] Still more preferably, as shown in (f) of drawing 4 , using vacuum deposition etc., by forming the about 0.1-1.0-micrometer antireflection film 17, loss of the quantity of light by echo can be reduced, and

an efficient solar battery can be manufactured so that the light-receiving side (top face) of this spherical semi-conductor cel 10 may be covered. As construction material of this antireflection film 17, SiO2, SNO2, and Si3N 4 grade are used, for example.

[0031] Of an example of the manufacture approach described above, a solar battery as shown in drawing 1 is formed.

[0032]

[Effect of the Invention] According to the manufacture approach of a solar battery and solar battery concerning this invention, as a full account was given above, the problem of the electric short circuit in the assembly process of a solar battery is radically solvable, it is quality and the good manufacture approach and good solar battery of the yield can be offered. Moreover, according to the manufacture approach of this invention, the productivity drive for cost reduction is made.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[The technical field which carries out an invention group] This invention relates to the manufacture approach of a solar battery, and a solar battery, and relates to the manufacture approach of a solar battery and solar battery especially using a spherical semi-conductor.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The electron and electron hole which were generated when the internal field has arisen into the pn junction part of a semi-conductor, light is applied to this and the electron-hole pair was made to generate are separated by the internal field, an electron is brought together in the n side, an electron hole is brought together in the p side, and if a load is connected outside, a current will flow towards the n side from the p side. This effectiveness is used and utilization of a solar battery is advanced as a component which transforms light energy into electrical energy.
[0003] In recent years, the technique of forming a circuit pattern on a spherical semi-conductor (Ball Semiconductor) with a diameter [of a single crystal, polycrystalline silicon, etc.] of 1mm or less, and manufacturing a semiconductor device is developed.
[0004] The manufacture approach of the solar array which connected many semi-conductor particles, using aluminum foil as one is proposed (JP,6-13633,A). By this approach, as shown in drawing 4 , the semi-conductor particle 207 which has the 1st conductivity-type epidermis section and the interior of the 2nd conductivity type is arranged so that it may project from the both sides of aluminum foil 201 in opening of aluminum foil, the epidermis section 209 of one side is removed, and an insulating layer 221 is formed. Next, the part inside [211] the 2nd conductivity type and the insulating layer 221 on it are removed, and the 2nd aluminum foil 219 is combined with the removed field 217. The flat field 217 offers good ohmic contact to the 2nd aluminum foil 219 as a current carrying part.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] According to the manufacture approach of a solar battery and solar battery concerning this invention, as a full account was given above, the problem of the electric short circuit in the assembly process of a solar battery is radically solvable, it is quality and the good manufacture approach and good solar battery of the yield can be offered. Moreover, according to the manufacture approach of this invention, the productivity drive for cost reduction is made.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, by the semi-conductor particle, i.e., the solar battery which covered with the cel of spherical diode with pn junction, which has the above 1st conductivity-type epidermis sections and the interior of the 2nd conductivity type In case the module substrate (the 2nd aluminum foil 219 of the above-mentioned conventional example) used as an electrode is equipped with the above-mentioned cel in an assembly process The amount of [the outcrop of the p type silicon layer which constitutes spherical diode, and / of n mold] silicon layer contacted the module substrate used as both electrodes, and there was a trouble of being easy to connect too hastily electrically.
[0006] Furthermore, in such a conventional assembly process, there was a trouble of it being highly said low that cost will become [productivity].
[0007] This invention can be accomplished in view of the above-mentioned trouble, can solve radically the problem of the electric short circuit in an assembly process, and productivity is high and it aims to let cost offer the manufacture approach of a solar battery and solar battery which can be reduced substantially.

[Translation done.]

MEANS

[Means for Solving the Problem] The process which lays two or more spherical semi-conductor cels which have the semi-conductor layer of the 2nd conductivity type formed as pn junction formed in the spherical substrate front face on which a front face constitutes the semi-conductor layer of the 1st conductivity type at least in the 1st of this invention on a conductive mesh-like member, The process which makes the mesh of the conductive member of the shape of said mesh carry out ********** alignment of said spherical semi-conductor cel, The process which pastes up said spherical semi-conductor cel and the conductive member of the shape of said mesh with a conductive paste, It is characterized by including the process joined on the process ground until said 1st semi-conductor layer exposes the underside of said spherical semi-conductor cel, and the insulating member which made the conductive member penetrate so that the 1st [said] semi-conductor layer which exposed the conductive member of the shape of said mesh may be touched. According to this configuration, the mesh of a conductive mesh-like member is made to carry out ********** alignment of the spherical semi-conductor cel, and it is fixable while connecting this to the conductive member of the shape of a mesh which is a ground electrode electrically with a conductive paste. Moreover, the takeoff connection of an inside electrode can be extremely formed in high degree of accuracy by grinding this collectively. Furthermore, since the mesh part of a conductive mesh-like member and the part which made the conductive member (inside electrode) in an insulating member penetrate can form so that it may correspond beforehand Since the location of each spherical semi-conductor cel can manufacture the solar battery which aligned at high degree of accuracy by the comparatively simple approach, the problem of the electric short circuit in the assembly process of a solar battery can be solved radically, and productivity is high and cost can decrease substantially.
[0009] The 2nd of this invention is characterized by including a wrap process for the light-receiving side of said spherical semi-conductor cel with an antireflection film. According to this configuration, loss of the quantity of light by echo can be reduced, and an efficient solar battery can be manufactured.
[0010] It is laid in the condition that two or more spherical semi-conductor cels aligned by ******** in the mesh of a conductive mesh-like member, this spherical semi-conductor cel and the conductive member of the shape of said mesh paste up with a conductive paste, and the 3rd of this invention is characterized by joining the 1st semi-conductor layer exposed on the underside of said spherical semi-conductor cel on the conductive member formed so that an insulating member might be penetrated. According to this configuration, the solar battery with which the location precision of each spherical semi-conductor cel aligned at high degree of accuracy can be obtained, the problem of an electric short circuit is solved radically, and the solar battery which productivity is high and cost can reduce substantially can be offered.
[0011] The 4th of this invention is characterized by covering the light-receiving side of said spherical semi-conductor cel with an antireflection film. According to this configuration, loss of the quantity of light by echo can be reduced, and an efficient solar battery can be offered.
[0012]
[Embodiment of the Invention] Hereafter, the manufacture approach of the solar battery concerning this invention and the operation gestalt of a solar battery are explained to a detail with reference to a drawing. In the following operation gestalten, although explained by using the 2nd conductivity type as n mold, using the 1st conductivity type as p mold, n mold and the 2nd conductivity type can be similarly manufactured for the 1st conductivity type as a p mold.
[0013] The solar battery concerning 1 operation gestalt of this invention is laid in the condition that two or more spherical semi-conductor cels 10 aligned by ******** in the mesh of the conductive mesh-like member 11 so that a decomposition block diagram to explain the general drawing to drawing 1 , and explain the configuration to drawing 2 may be shown.
[0014] As a conductive member 11 of the shape of this mesh, it is desirable to use a conductive metal,

and aluminum, stainless steel, molybdenum, etc. are used as a metaled class. About the approach of forming the conductive member 11 of the shape of this mesh, it can form by casting which slushes a metal into mold, the pressing method which pierces a mold from a metal plate, for example.
[0015] And each of this spherical semi-conductor cel 10 and the conductive mesh-like member 11 paste up with the conductive paste 16, and the conductive member 11 of the shape of this mesh serves as a ground electrode of a solar battery 1. As this conductive paste 16, solder, a silver paste, a copper paste, etc. can be used, for example.
[0016] in addition -- although the configuration of a mesh is shown as a rectangle in drawing 1 and drawing 2 -- other configurations -- ****** -- for example, circular, then the time of pasting up the spherical semi-conductor cel 10 with the conductive paste 16 -- the liquid of a paste -- who can do it few.
[0017] Moreover, p mold polycrystalline silicon (semi-conductor layer of the 1st conductivity type) 14 exposed on the underside of the spherical semi-conductor cel 10 is electrically joined to the conductive member 13 formed by screen-stencil, plating, etc. so that an insulating member 12 may be penetrated. For example, insulating tapes, such as a general printed circuit board or a TAB tape using a glass epoxy resin, BT resin, etc. as this insulating member 12, can be used.
[0018] And inside electrode 13a of the solar battery 1 formed so that this conductive member 13 might project on the underside of an insulating member 12 is formed every spherical semi-conductor cel 10.
[0019] The light-receiving side of the spherical semi-conductor cel 10 can also consider as the configuration covered with the antireflection film 17 (dotted-line part of drawing 1) still more preferably. Thereby, loss of the quantity of light by echo can be reduced, and it becomes an efficient solar battery.
[0020] Next, an example of the concrete manufacture approach is explained below. Each process of the manufacture approach is shown in drawing 3 and drawing 4 using some cross sections of the solar battery concerning 1 operation gestalt of this invention.
[0021] First, an example of the formation approach of the spherical semi-conductor cel 10 used for this operation gestalt is explained. It is made to fall, heating p mold polycrystalline silicon grain with a diameter of 1mm or p mold amorphous silicon grain in a vacuum, crystalline good p mold polycrystalline silicon ball (the 1st conductivity-type semi-conductor layer) 14 is formed, and n mold polycrystalline silicon layer (the 2nd conductivity-type semi-conductor layer) 15 is formed in this front face with the CVD method using mixed gas, such as a silane containing phosphoretted hydrogen. A CVD process performs thin film formation here by carrying out supply blowdown of the gas heated by desired reaction temperature, conveying a silicon ball within a thin tube.
[0022] In addition, this process can also form n mold polycrystalline silicon layer 15 by making desired gas contact on the way of [drop] while it spheroidizes making it fall heating p mold polycrystalline silicon grain or p mold amorphous silicon grain in a vacuum and forms p mold polycrystalline silicon ball 14. Moreover, n mold impurity diffused layer may be formed in the front face of p mold polycrystalline silicon grain or p mold amorphous silicon grain by doping which used a gaseous-phase thermal diffusion method and ion-implantation.
[0023] Next, the mesh of the conductive mesh-like member 11 is made to carry out ********** alignment of the spherical semi-conductor cel 10 formed as mentioned above. In order to use many spherical semi-conductor cels 10 at this time, as it lays so that many spherical semi-conductor cels 10 may be scattered on the conductive mesh-like member 11, and this scattered spherical semi-conductor cel 10 is swept with the brush etc., as a desirable example of an approach which makes a mesh carry out ********** alignment efficiently, the ********** approach is in the mesh of the conductive mesh-like member 11.
[0024] Moreover, there is the approach of using a cel adsorption fixture as shown in drawing 6 as other more desirable examples. Hereafter, this approach is described. Drawing 6 is the sectional view (a) of a cel adsorption fixture, and a bottom view (b). In drawing 6 , the cel adsorption fixture 18 is the dimension which agrees in the mesh of the conductive mesh-like member 11 in the base (refer to (b) of drawing 6), and two or more crevices 19 in which the spherical semi-conductor cel 10 is held are formed.
[0025] And attract the spherical semi-conductor cel 10 with an aspirator (not shown), and it is made to hold in this crevice 19, and the spherical semi-conductor cel 10 is inserted in in the mesh of the conductive mesh-like member 11 with the condition of having made it drawing in, and an aspirator is made to stop and lay. The condition of having made the mesh of the conductive member 11 of the shape of a mesh which shows the spherical semi-conductor cel 10 to (a) of drawing 3 carrying out ********** alignment using the above approach is (b) of drawing 3 .
[0026] Next, as shown in (c) of drawing 3 , the spherical semi-conductor cel 10 and the conductive member 11 of the shape of said mesh are pasted up with the conductive paste 16. Thereby, the conductive mesh-like member 11 serves as a ground electrode of a solar battery.

[0027] Next, by grinding, as shown in (d) of drawing 3 , n mold polycrystalline silicon layer 15 is removed from the spherical semi-conductor cel 10 until p mold polycrystalline silicon 14 of a field exposes a part. Here, the spherical semi-conductor cel 10 is inserted in the conductive mesh-like member 11, and it fixes in conductive paste 16 grade, and in order to hold the spherical semi-conductor cel 10 in one, to make grinding equipment contact and to perform grinding, it becomes possible to acquire a flat and uniform disclosure side. In the case of this grinding, the above-mentioned cel adsorption fixture 18 can be used, grinding can be carried out in the condition of having made the spherical semi-conductor cel 10 adsorbing, and grinding can be performed thereby more certainly.
[0028] Next, as shown in (e) of drawing 4 , it joins on the insulating member 12 which made the conductive member 13 penetrate so that p mold polycrystalline silicon 14 which exposed the conductive mesh-like member 11 may be touched. At this time, the above-mentioned cel adsorption fixture 18 is used, and you may make it join in the condition of having made the spherical semi-conductor cel 10 adsorbing, alignment of the spherical semi-conductor cel 10 and the conductive member 13 can be made easy by this, and it can join to an insulating member 12 more certainly.
[0029] In accordance with the pitch of the mesh of the conductive mesh-like member 11, the part which made the conductive member 13 in this insulating member 12 penetrate is formed so that it may correspond beforehand. And this conductive member 13 that corresponded every spherical semi-conductor cel 10 is formed so that it may project on the underside of an insulating member 12, and this projection part is set to inside electrode 13a of a solar battery.
[0030] Still more preferably, as shown in (f) of drawing 4 , using vacuum deposition etc., by forming the about 0.1-1.0-micrometer antireflection film 17, loss of the quantity of light by echo can be reduced, and an efficient solar battery can be manufactured so that the light-receiving side (top face) of this spherical semi-conductor cel 10 may be covered. As construction material of this antireflection film 17, SiO2, SNO2, and Si3N 4 grade are used, for example.
[0031] Of an example of the manufacture approach described above, a solar battery as shown in drawing 1 is formed.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the general drawing of the solar battery concerning this invention.
[Drawing 2] It is a decomposition block diagram for explaining the configuration of the solar battery concerning this invention.
[Drawing 3] It is production process drawing explaining the manufacture approach of the solar battery concerning this invention.
[Drawing 4] It is production process drawing explaining the manufacture approach of the solar battery concerning this invention.
[Drawing 5] It is drawing showing the solar battery of the conventional example.
[Drawing 6] They are the sectional view (a) of a cel adsorption fixture, and a bottom view (b).
[Description of Notations]
1 Solar Battery
10 Spherical Semi-conductor Cel
11 Conductive Mesh-like Member (Ground Electrode)
12 Insulating Member
13 Conductive Member
13a Inside electrode
14 P Mold Polycrystalline Silicon (Semi-conductor Layer of 1st Conductivity Type)
15 N Mold Polycrystalline Silicon (Semi-conductor Layer of 2nd Conductivity Type)
16 Conductive Paste
17 Antireflection Film
18 Cel Adsorption Fixture
19 Crevice

[Translation done.]

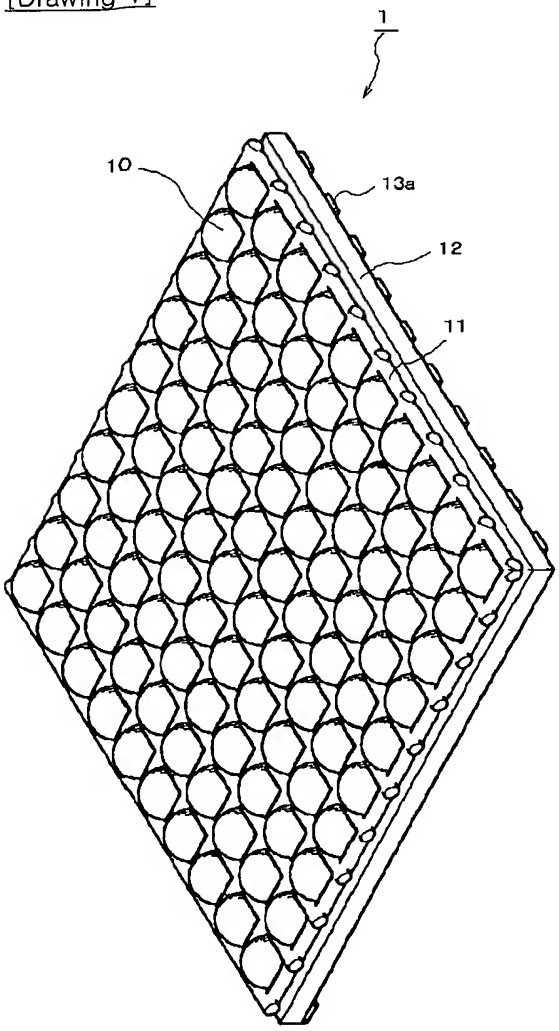
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.

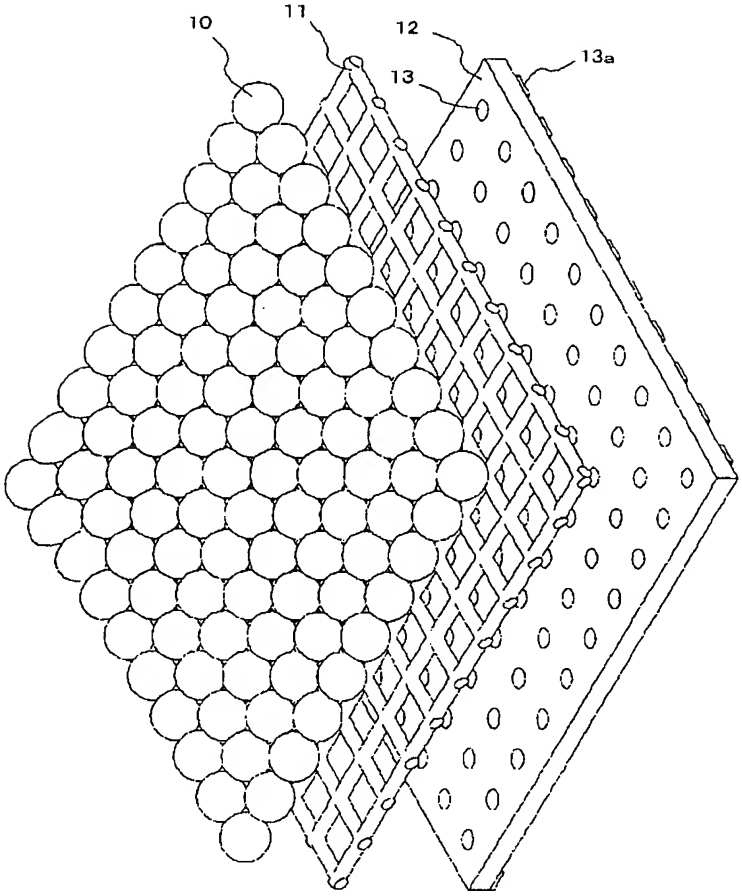
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

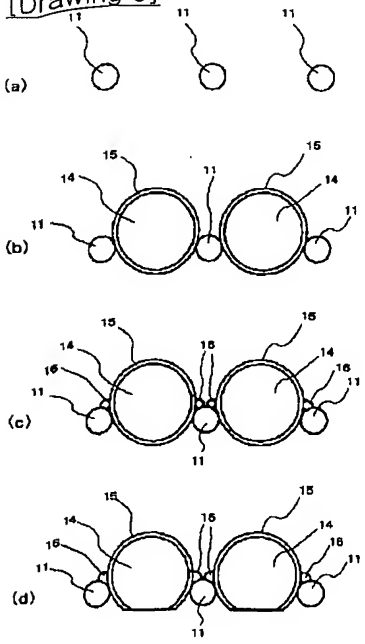
[Drawing 1]



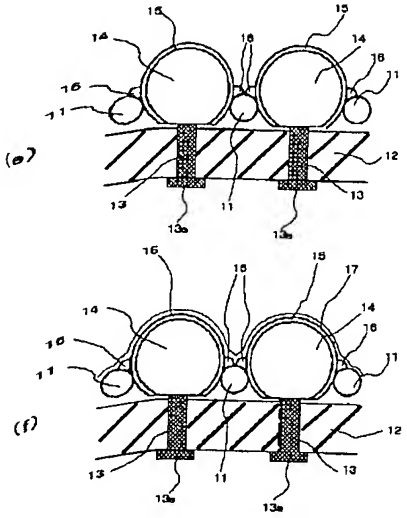
[Drawing 2]



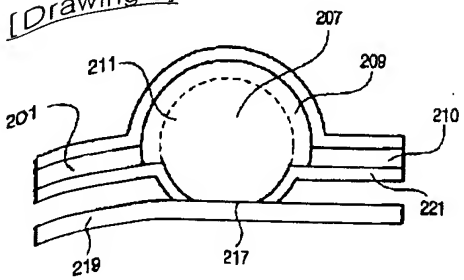
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Drawing 6]